

# "SERGEANT" ROCK DRILLS

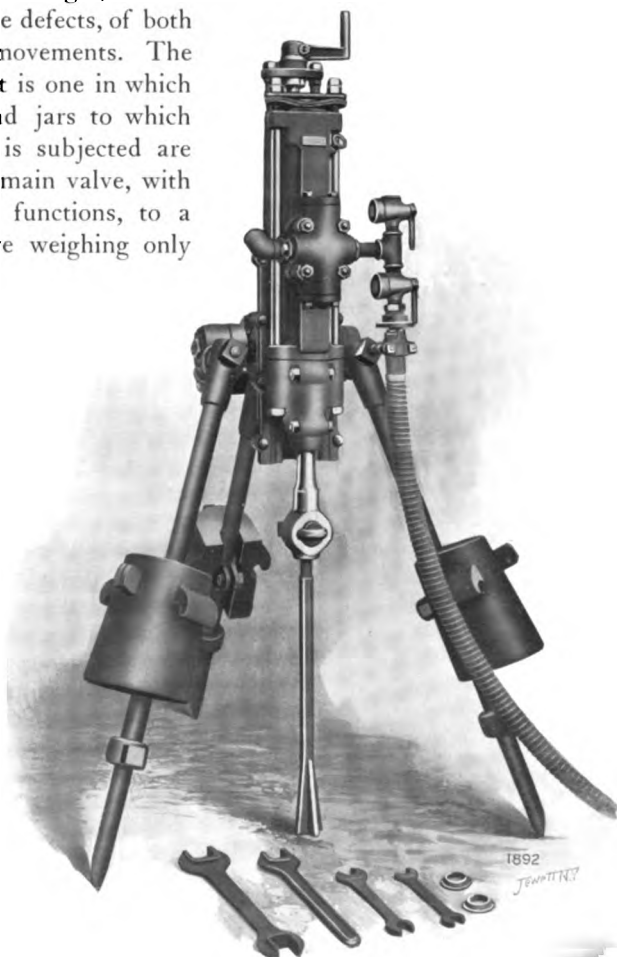
INGERSOLL-RAND COMPANY

11 BROADWAY, NEW YORK

Form No. 4202

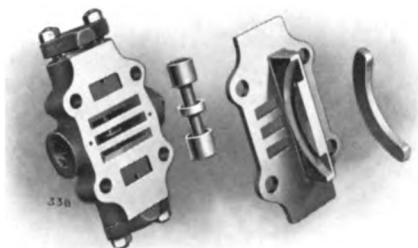
December, 1910

THE "Sergeant" drill is a successful combination of the "independent" air-thrown valve of spool type, with an improved modification of the tappet action. It retains certain advantages, while avoiding the defects, of both of these earlier valve movements. The "Sergeant" movement is one in which the strains, shocks and jars to which the tappet or rocker is subjected are transferred from the main valve, with its vital and delicate functions, to a smaller auxiliary valve weighing only a few ounces, specially designed to withstand this service to best advantage and cheaply replaced when worn. But the wear upon it is almost imperceptible, for its bearing surfaces are very large, are highly finished, and are freely lubricated by the oil entering the drill. A valve seat between valve chest and



cylinder carries an extension fitting into a recess in the latter. In this extension is milled an arc-shaped groove or slot in which the light auxiliary valve slides freely. The main valve is of the balanced air-thrown spool type, with wearing surfaces ground to a plug fit in a reamed valve chest.

One end or other of the auxiliary valve projects slightly into the cylinder bore and is pushed or lifted by the piston in its travel. This movement is perfectly free and very short—only enough to uncover a small port which releases pressure from one end of the main valve; full pressure on the other end then throws this main valve, opening wide the main port and admitting full pressure to the piston for the return stroke.

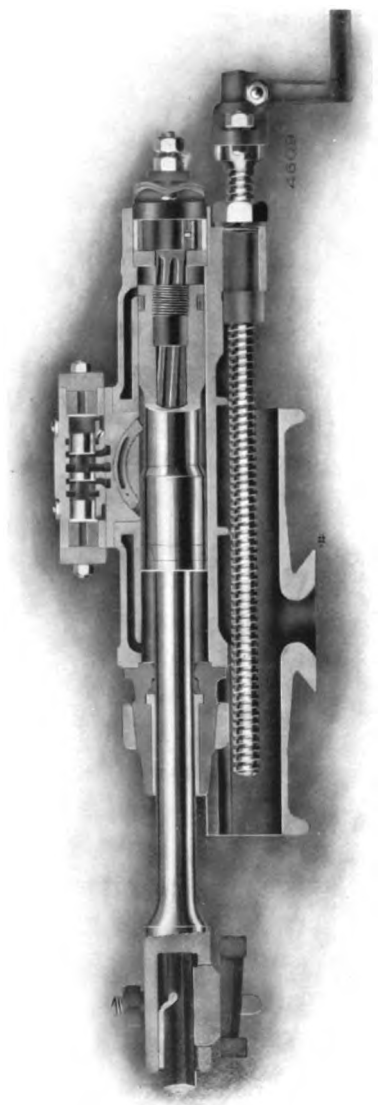


**"Sergeant" Chest, Valves and Parts**



**Ingersoll-Rand Rock Drills on the Panama Canal**

# 'S E R G E A N T' R O C K D R I L L S



Longitudinal Section of "Sergeant" Rock Drill, Showing Valve Mechanism

## ' ' S E R G E A N T ' ' R O C K D R I L L S

The auxiliary valve is simply a trigger which releases the main valve. It is accurately machined from the best tool steel, and is hardened. Being very light, its impact cannot injure or retard the piston; nor is there any of that crowding of the piston against the opposite cylinder walls which has been such a fruitful source of trouble in ordinary tappet drills and responsible for the rapid wear of rings, pistons and cylinders in machines with ordinary unbalanced, hard-moving tappet motions. Pressure being on the back of the auxiliary valve, continued wear only improves its seating. Its action is quick, positive and perfectly free.

The main valve is accurately ground from hardened steel and is protected by buffers at the end of its travel; breakage is unknown. Being perfectly balanced, it moves freely with little wear, and the full port opening is secured almost instantly. The combined action



Six Ingersoll-Rand Drills at the Alpha Portland Cement Company's Quarry

of these two valves is such that admission and exhaust ports, instantly opened, *retain full opening to the end of the stroke*. There is therefore no cushion pressure to retard the stroke and diminish the blow; and for a given diameter of cylinder and a given weight, this is by all odds the most powerful drill made.

The "Sergeant" drill has a wide variation of stroke, secured simply by "cranking" the machine forward, without any valves or other regulating devices. The blow is absolutely dead, and no machine of equal cylinder diameter can match it in its effective penetrating quality. The ability of this drill to run on a very short stroke is of enormous advantage in starting a hole on an oblique surface and in avoiding a glancing blow, with consequent breakage of the starter shanks; it also admits of the hole being quickly started without "funneling" or "rifling." This feature is of vital importance under many drilling conditions — such as working through seams, in shelly or caving material where pebbles fall under the bit, in crevices or alternate layers of hard and soft rock, and in many other circumstances familiar to drill runners and likely to be encountered anywhere. The drill also "muds" or cleans the cuttings out of the hole in a most effective manner.

Another most important advantage of the variable stroke of the "Sergeant" drill, and one appealing to the practical man, is that it makes possible the use of odd steels which, by wear or breakage, have become of uneven length. Some other drills cannot use steels differing more than two inches from standard lengths. Steels



Ingersoll-Rand Rock Drill on Harbor Improvement Work, Fishguard, Wales

shortened as much as five inches can be used with this drill. This fact allows more leeway in starting the machine after changing steels, without moving the setting, wasting time in getting an odd steel shortened, or hunting up a steel of the right length. Drills of other types are compelled to start on practically full stroke.

Another valuable feature of design in this drill is that the valve action is not dependent upon the condition of cylinder, piston or rings. It has an absolutely positive and independent valve movement. Other types of independent valve machines operate well *only* so long as the piston is a good plug fit in the cylinder; and, cylinder walls, piston and rings being inevitably subject to wear and consequent leakage, the valve action is soon at a serious disadvantage and requires very extensive repairs or entire rebuilding. The auxiliary valve, in striking contrast to this, will perform its functions perfectly,



Ingersoll-Rand Drills on Quarry Bars Digging Foundations for  
New York Edison Building

even with a loose piston or with the rings entirely absent from the machine. To this exclusive feature of design is largely due the sustained capacity of this drill. But it is almost unnecessary to state that a tight piston is always desirable in the interest of highest efficiency and good air or steam economy.

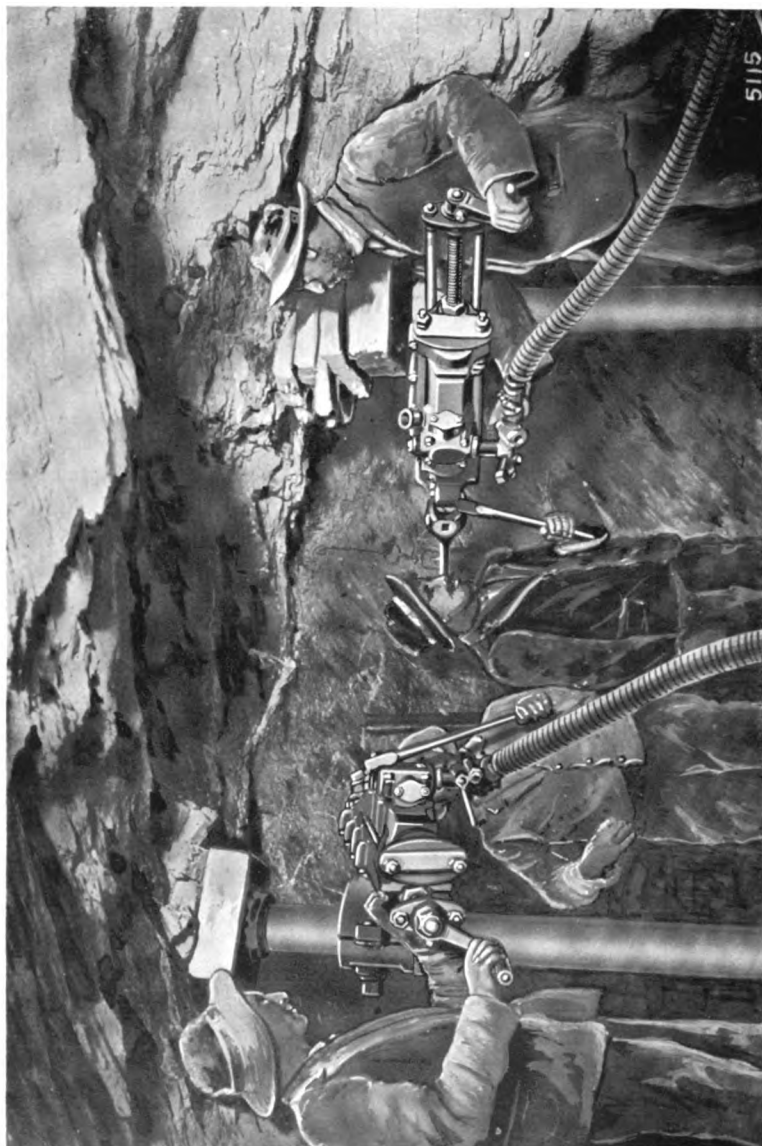
Remarkable records have been made in the hardest rock by drills of this type; performances just as remarkable have been noted in soft and medium rocks — facts leading to the belief that this can be justifiably called an “all-round” drill. For rapid tunnel driving and hard service anywhere, it is without doubt the best machine today. It is a rapid and economical drill under almost any condition, except where its dead, stunning blow loses effect in “springy” or elastic material. The best results are always secured with live, active air; but dry steam brings out a good performance also. It is a simple, rugged machine and the frequent remark about it is that “any blacksmith can keep it in good running order.” All bolts and threads are standard; there is nothing “special” about it. In long-continued service under the most severe conditions, its repairs have been found to be less than upon any other model of drill; while recent improvements in details have added to its economy and power.

**The “Sergeant” drill is today the most powerful, most reliable and most effective independent valve machine on the market, and the most economical in the matter of repairs and air consumption.**

Experience under various conditions has developed a variety of drill chucks, valve chests and drill shells which are available for use with the “Sergeant” drill and are offered as options, to be furnished on order. These are illustrated and described on pages 9 to 19 following. Attention is called to the particular advantages of each of these types, as they may be found valuable, and to be preferred by the trade, for certain classes of work and under certain conditions. None of them are experimental, but all have been thoroughly tried out in practical work and are known to be right.

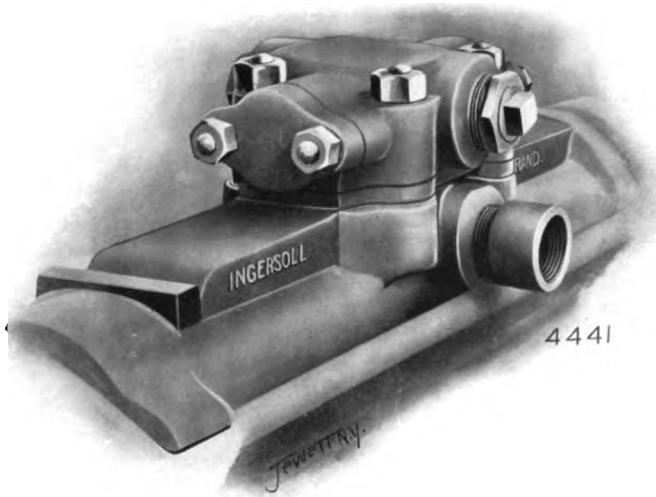
Detailed specifications of the “Sergeant” drill in all its types and sizes are tabulated on page 21.

'S E R G E A N T' R O C K D R I L L S



Two Ingersoll-Rand Drills in the Jungfraubahn Tunnel

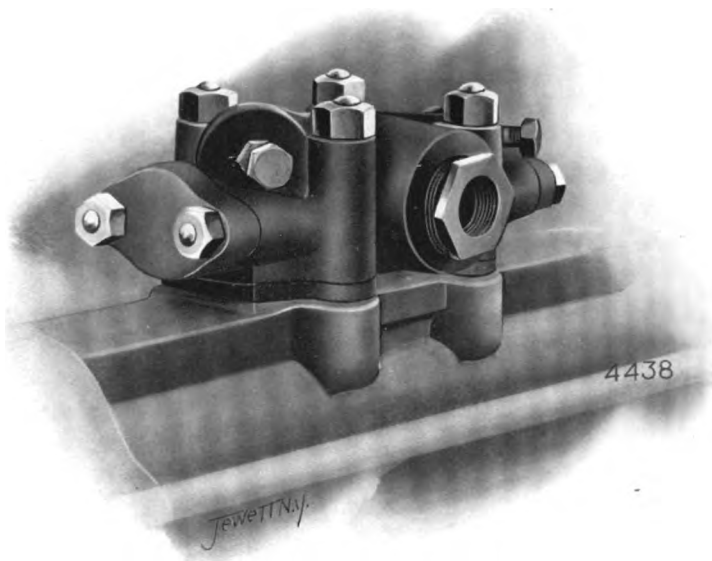




The Standard "Sergeant," 24 and 44-Type Valve Chest

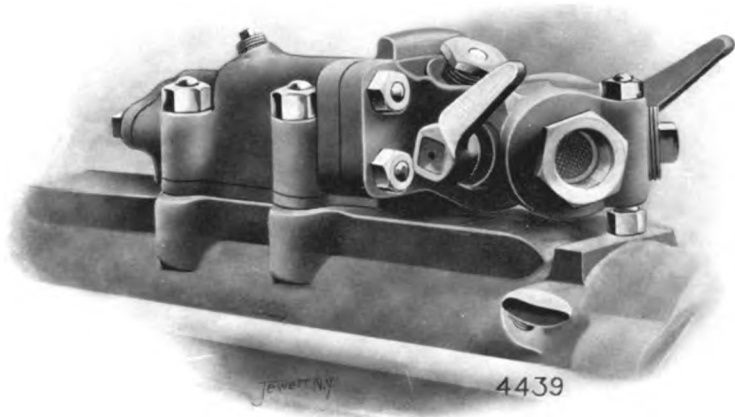
## "Sergeant" Valve Chests

*The "24" and "44-Type" Valve Chest* shown in the illustration above is considered the standard chest for "Sergeant" drills, and is always furnished unless the order distinctly specifies some other type. This is a very simple, compact device, of great durability. It has two air connections, one on either side, so that the hose can be attached on the most convenient side. The air inlet opening not in use is closed by a plain screw plug. Inlet and discharge openings are fitted with removable bushings which protect the threads in the chest and cylinder from injury by repeated screwing and unscrewing of connections. The removal of two nuts on the end of the chest releases the chest cover so that the main valve can be inspected or removed without taking the chest from the cylinder. Access is had to the auxiliary valve by removing the nuts on the studs holding the chest to the drill.



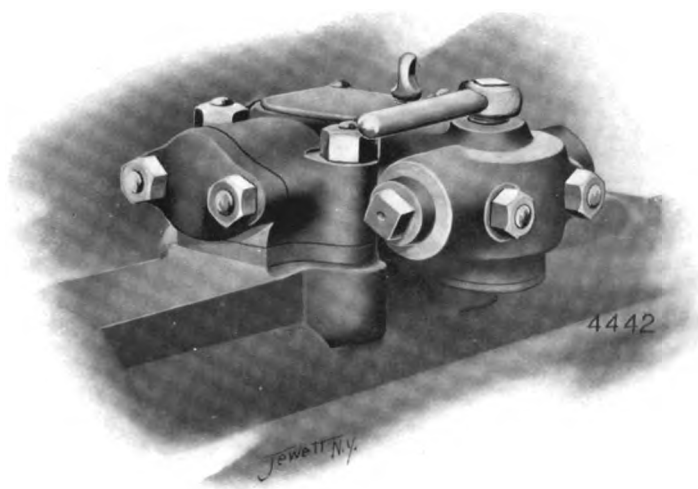
**The "Sergeant" 44-52-Type Valve Chest**

*The "44-52-Type" Valve Chest* here illustrated is an improvement on the "52-Type" adjustable or compensating chest used for so many years on the "Sergeant" drill. It is a special device, which is furnished only on specific order. The distinguishing feature is that it provides a means for compensating for the wear in the main valve. Any spool valve, after long service, allows some air to escape past it, more and more affecting the operation of the drill. Without special adjustment such as this chest affords, such a condition can be corrected only by substituting a new valve and chest. In the "44-52" chest, however, an adjusting screw at either end permits compensation for leakage in the main valve, so that the operation of the drill is not impaired. The character and quality of the blow can also be varied, in the hands of a skillful man, for different drilling conditions by means of these adjustments. Full directions for adjusting the "44-52" chest accompany each drill so equipped.



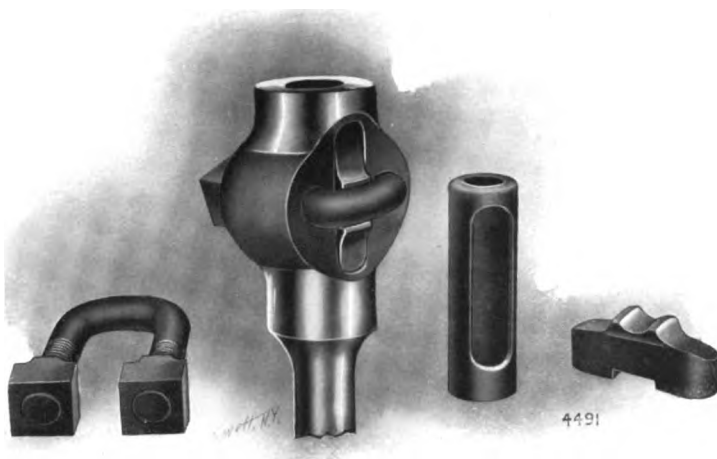
The "Sergeant" 15-88-Type Valve Chest

The "15-88-Type" Valve Chest illustrated above is another of the special chests developed by the Company in connection with the "Sergeant" drill. It differs from the standard "24" chest only in having a throttle valve rigidly bolted to the rear of the chest instead of being placed in the air inlet connection. Two handles are provided for this throttle, so that it can be manipulated conveniently from either side of the drill. The air inlet connections — two of which are provided, one on each side — point backward along the cylinder, so that the hose connection does not take up space beside the drill. The inlet openings are screened against the admission of foreign matter to the chest. The regular rock drill oiler, coupled in the air supply, cannot be conveniently used with this chest, so a ball oiler is provided in the back and top of the chest, through which oil may be fed as needed. The air inlet and exhaust openings are bushed. This chest is particularly adapted for heading or narrow drift work where it is desirable to mount the drill close to the roof or wall.



**The "Sergeant" 15-24-Type Valve Chest**

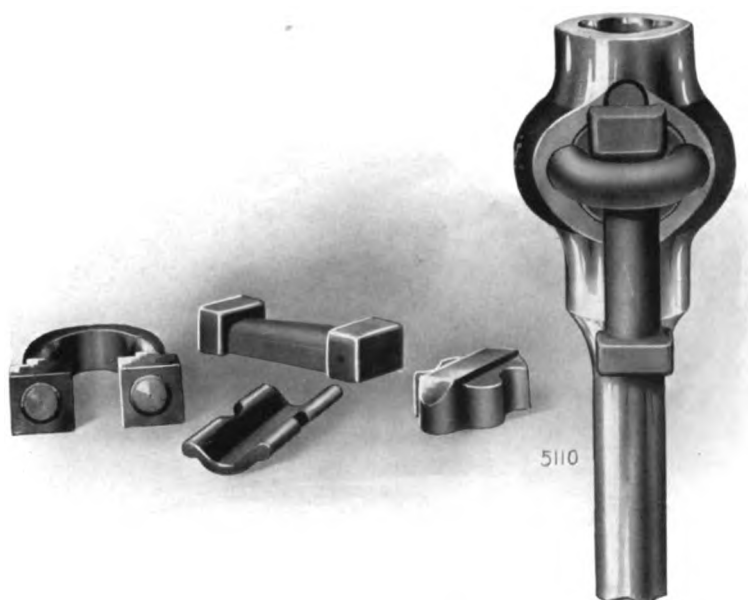
*The "15-24-Type" Valve Chest* is another special chest furnished only on the customer's order. It has been used extensively in South Africa, but has also been favorably received in other mining countries. In essentials it is the standard "24" type of chest, with a throttle valve bolted to one side of the chest casting. The throttle has a single handle, at the top, with air inlet openings at front and rear. One or the other of these is closed by a screw plug, the hose when connected lying close to, and parallel with, the drill, taking up very little room at the side. Two studs hold the throttle to the chest. Two studs at each end of the chest hold the chest covers in place, the removal of either of which permits withdrawing the main valve for examination or removal. The four studs holding the chest to the cylinder also hold in place the auxiliary valve plate, containing the auxiliary valve. The main valve is accessible without taking the chest from the cylinder. An opening on top of the chest, closed with a thumb-screw, provides for oiling the machine.



The "Sergeant" 32 Drill Chuck

## **"Sergeant" Drill Chucks**

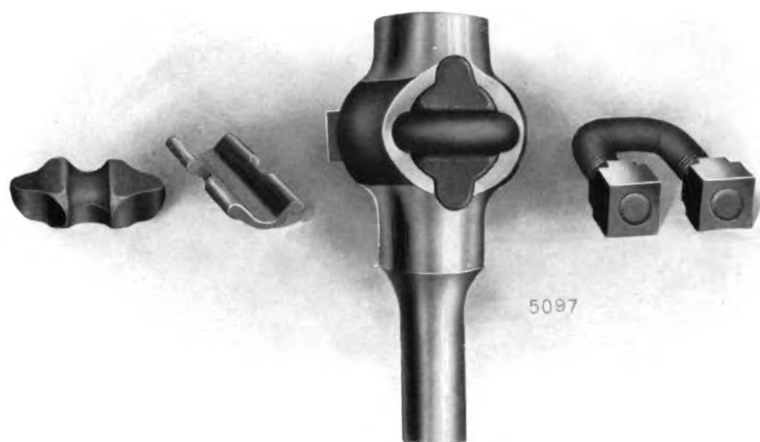
*The "32-Type" Chuck* which is illustrated above is considered the standard chuck on all "Sergeant" drills, and is always furnished unless the customer specifies some of the other chucks offered as options and described later. The "32" chuck is adapted only for round-shank steels and in this work has proved to be a powerful, reliable chuck, giving perfect satisfaction. The chuck forging is very strong and heavy, treated in oil with the rest of the piston and therefore very tough and strong. The bore is large enough to take a hardened steel bushing, which is pressed in place and which receives the steel shank. This bushing can be removed and replaced when worn. The chuck key is of hardened steel and of very generous length, giving a powerful grip on the steel. It is completely recessed in the chuck. The U-bolt is of tough, oil-treated steel, of large cross section, with nuts turned to seat in countersinks in the chuck.



The "Sergeant" 42 Drill Chuck

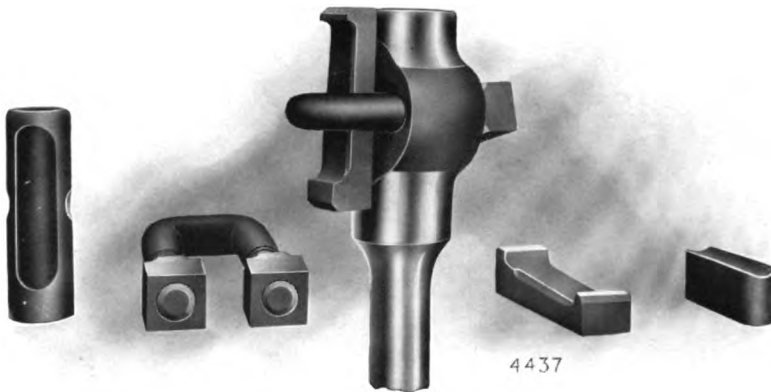
The "42-Type" Chuck here shown is in general appearance very similar to the standard "32" chuck. But in the "42" chuck the plain round bushing is replaced by a half-bushing of hardened steel, which slips in the end of the chuck and is prevented from turning by lips which engage in slots. The U-bolt passing through grooves in the sides of the bushing prevents the latter from slipping out. The chuck bushing is reversible and can be turned end for end when worn. A hardened steel chuck key of ample length grips the steel opposite the bushing; and between key and U-bolt a steel wedge is inserted, so that the steel is tightened or released by a hammer blow on this wedge. The U-bolt nuts are simply for adjustment in maintaining the necessary tightness of the wedge. Both chuck key and chuck bushing are so constructed that either round-shanked steel, or round or octagon steel without shank, can be used. Octagon steel without shank is usually preferred, however. Each size of chuck will also take a small variety in the size of octagon or round steel, without loss of time: an advantage which is not found in any other construction of drill chuck.

*The "42" chuck, owing to its large diameter, cannot be used with the "44" shell, described later.*



The "Sergeant" 44 Drill Chuck

The "44-Type" Drill Chuck shown in the illustration above is a development from, and a modification of, the "42" chuck shown on the previous page. It will be noted in the picture herewith, which illustrates the parts, as well as the assembled chuck, that there is no steel wedge in the "44" type. The chuck key is held directly by the U-bolt and is clamped tight to the steel by the U-bolt nuts on the opposite side. The chuck key is of hardened steel and, instead of being long and narrow, is circular in section, giving a wide bearing in the chuck proper which opposes wear. The "44" chuck bushing is of the same type as that used in the "42" chuck, a half-bushing of hardened steel with lips engaging grooves in the interior of the chuck, which prevents the bushing turning. It is prevented from falling out when loose by grooves on each side which engage the U-bolt. This bushing is reversible and can be turned end for end when worn. With the "44" type chuck either round-shanked steel, or round or octagon steel without shank, can be used. Each size of chuck will also take a small variety in the size of octagon or round steel, without loss of time: an advantage which is not found in any other construction of drill chuck.

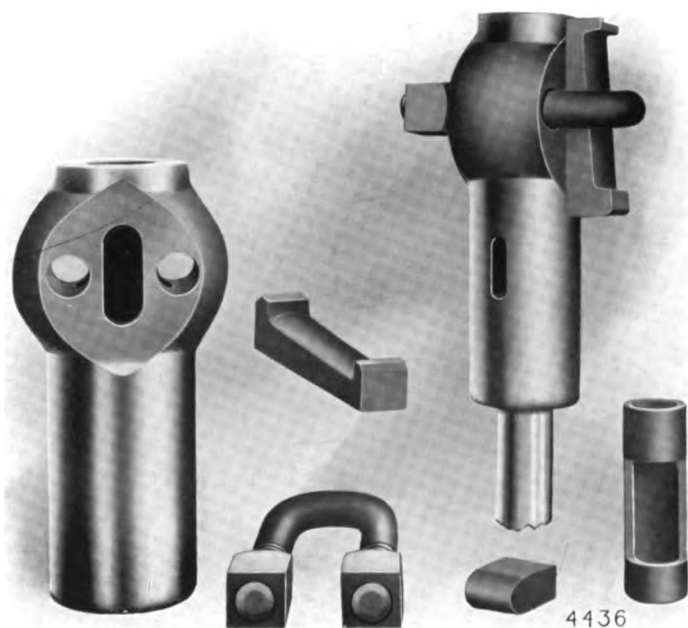


The "Sergeant" 14-Type Drill Chuck

The "14-Type" Chuck is another style, shown in the accompanying illustration and furnished only on special order. It is a development of the standard "32" chuck to include the feature of wedge clamping and U-bolt adjustment. A round bushing of hardened steel is used to receive the shank of the steel, an opening in the side of the bushing admitting the chuck key. The chuck key is a long piece of hardened steel, rounded on one side to fit the steel and flat on the opposite side. It recesses in the chuck and bushing. Between U-bolt and chuck key a steel wedge is interposed, giving a powerful grip on the steel by a blow of a hammer and being released by a blow in the opposite direction, with the least loss of time. The arrangement is such that the blow of the drill tends to tighten the wedge. The U-bolt nuts recess in countersunk spaces in the chuck and are used only in adjusting to give the necessary tightness to the wedge, as the parts wear.

The "14" chuck, owing to its large diameter, cannot be used with the "44" shell, described later.





**The "Sergeant" 12 Drill Chuck**

*The "12-Type" Chuck* is a fifth style offered as an option with "Arc Valve" Tappet drills and supplied only when the customer specifies it in his order. It has not been so generally used as the types just described, but still finds application in certain fields. This is a detachable chuck, forged from tough steel, oil treated and carefully machined. It is bored in the rear on a long taper, fitting on a corresponding taper on the piston rod of the drill. The operation of the machine tends to drive this chuck tighter on the rod and makes it perfectly rigid. A transverse opening in the chuck admits a taper drift for loosening it from the rod when necessary. In other details the "12" chuck is very similar to the "14" chuck previously described. It uses a hardened steel round chuck bushing, pressed in place; hardened steel chuck key; long driving wedge for gripping and releasing the steel; and a powerful U-bolt providing adjustment for the wedge.



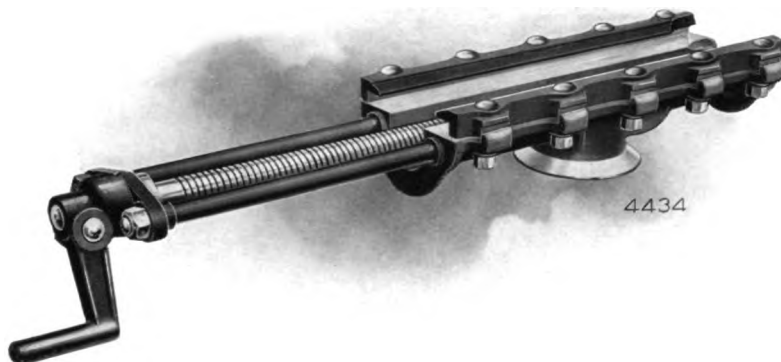
**The "Sergeant" 24 Drill Shell**

### **"Sergeant" Drill Shells**

*The "24-Type" Shell* here shown is the standard shell regularly furnished with "Arc Valve" Tappet drills. It is made of a tough malleable iron, strongly reinforced at the proper points. It is fitted with the standard "Sergeant" reversed cone. The guide surfaces are unusually wide, with caps separate and adjustable for wear.

Feed screws are made of tough alloy steel and the feed nut is of hard steel. Standards are forged of high-grade alloy steel. Feed crank and crosshead are of a tough, selected metal.

The "24" shell has proved itself to be a thoroughly practical and successful shell under most working conditions and has given entire satisfaction.



**The "Sergeant" 44 Drill Shell**

*The "44-Type" Shell* was designed to meet the demand for a stronger shell than the "24" type and can now be furnished on special order for all sizes of the "Arc Valve" Tappet drill (see table, page 13). It may be well to repeat here that the "44" shell cannot be used on drills fitted with the "42" and "14" chucks, because of the length of this new shell and the large diameter of these chucks.

The "44" shell is considerably longer than the standard "24" type, giving a correspondingly better support to the drill when at the extremity of the forward feed. Wear on shell guides and guide caps can be taken up by removing liners placed between these parts. There are also shoulders on the outside of the guide caps, beneath which liners are placed to afford lateral adjustment for wear. The standards, which are held in place by nuts and positive lock washers, extend the full length of the "44" shell and the latter is strongly reinforced at points of great stress. In other details, this later shell corresponds closely with the standard "24" shell.

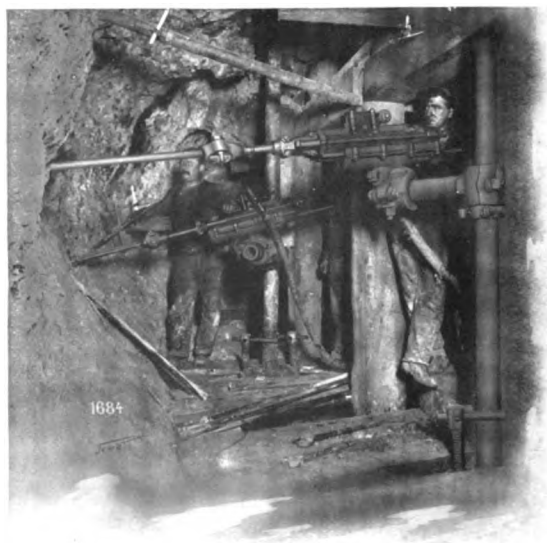
## "ARC VALVE" TAPPET ROCK DRILLS



**"Arc Valve" Tappet Drills in the Cripple Creek District, Colo.**

Over 75 per cent. o. all the Drills used in this district are Ingersoll-Rand machines.

**In the seventeen hundred foot level of the Original Mine, Butte, Mont.**



# "ARC VALVE" TAPPET ROCK DRILLS

Descriptive Table of "Arc Valve" Tappet Rock Drills—(32 Type)

Symbol indicating size and type.....	A 32	A 50	B 32	C 32	D 32	E 32	F 32	
<b>DIMENSIONS:</b>								
Diameter of cylinder.....	2 1/4	2 1/4	2 1/2	2 1/4	3 1/2	3 1/4	3 3/4	
Length of stroke.....	5	5	5 1/2	6 1/2	6 1/2	6 1/2	7 1/4	
Length of drill from end of crank to end of piston.....	36	36	43	50	50	50	52	
Depth of hole drilled without change of bit.....	15	15	20	24	24	24	24	
Diameter of supply inlet (standard pipe).....	3/4	3/4	3/4	1	1	1	1	
Approximate strokes per minute with 75 lbs. pressure at drill.....	500	500	500	375	350	350	300	
Depth of vertical hole each machine will drill easily from 1 to.....	6	6	8	10	14	16	20	
Diameter of holes drilled as desired, from.....	5/8 to 1 1/4	5/8 to 1 1/4	1 to 1 1/2	1 1/4 to 2 1/4	1 1/2 to 2 1/4	1 3/4 to 2 3/4	1 3/4 to 3	
Average work done per 10 hours in granite down holes, including time lost in setting drill and changing bits.....	70	70	70	70	70	75	75	
Diameter of octagon steel used.....	3/4 or 7/8	7/8 or 3/4	1 and 7/8	1 1/4 and 1	1 1/4 and 1 1/8	1 1/4 and 1 1/8	1 3/8 and 1 1/4	
Size of shanks (diameter and length).....	3/4 x 5	7/8 x 5	1 x 5	1 x 5 1/2	1 1/8 x 6	1 1/8 x 6	1 1/4 x 6	
Number of pieces in set of steels to drill holes in depth as stated.....	5	5	5	5	7	8	10	
Best size of boiler to give plenty of steam at high pressure.....	5 H. P.	5 H. P.	8 H. P.	8 H. P.	8 H. P.	10 H. P.	12 H. P.	
Best size of supply pipe to carry steam 100 to 200 ft.....	3/4	3/4	1	1	1	1	1 1/4	
<b>APPROXIMATE WEIGHTS:</b>								
Drill, unmounted, with wrenches and fittings, not boxed lbs	140	145	185	270	285	295	415	
Drill, unmounted, with wrenches and fittings, boxed..... lbs	170	185	230	320	335	345	465	
Tripod, without weights, not boxed..... lbs	85	85	165	165	165	210	275	
Tripod, without weights, boxed..... lbs	120	120	220	220	220	265	340	
Holding down weights, not boxed..... lbs	120	120	270	285	285	330	375	
Holding down weights, boxed..... lbs	140	140	295	315	315	360	420	
Drill, tripod, weights, fittings and wrenches, boxed..... lbs	430	445	745	855	870	970	1225	
Drill and tripod, without weights and wrenches, not boxed lbs	215	220	335	419	434	489	673	
One set of steels, bundled..... lbs	35	46	66	101	229	292	536	
One length of hose, coupled, boxed..... lbs	90	90	105	105	105	105	105	
<b>SHIPPING MEASUREMENTS (OVER ALL):</b>								
Box with unmounted drill and fittings..... ft. in.	36 11 010	36 10 010	47 011 14	47 011 14	47 011 14	47 011 14	48 15 10	
Boxed with tripod..... ft. in.	33 13 07	33 13 07	45 16 010	45 16 010	45 16 010	45 16 010	46 11 010	
Box with three weights..... ft. in.	21 010 09	21 010 09	27 10 010	27 10 010	28 12 010	28 12 010	210 14 10	
Box with one length of hose..... ft. in.	28 28 08	28 28 08	210 28 06	210 28 06	210 28 06	210 28 06	210 28 06	
Prices (f. o. b. Factory or New York) and Telegraph Names: Drill complete, with wrenches and fittings, without tripod or column.....	Kabook \$170	Kaboschir \$170	Kabouters \$200	Kabuff \$220	Kabuiskool \$250	Kabulistan \$260	Kabyile \$290	

NOTE.—Drill complete includes drill, throttle, oiler, and wrenches, and does not include mounting, steels, hose or blacksmith's tools. For full information and prices on Tripods, Columns, Hose, Blacksmith's Tools, and Steels, see Pamphlet No. 9003.

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Jewett, H. F.

# "ARC VALVE" TAPPET ROCK DRILLS

## Duplicate Part List for Arc Valve Tappet Rock Drills

### Valve Chest and Valve Motion Complete

- 202 Valve Chest
- 204 Valve
- 205 Valve Seat
- 206 Valve Tappet Pin and Nut
- 208 Valve Tappet complete (includes parts 208A and 208B)

\*208A Valve Tappet Plunger

\*208B Valve Tappet Plunger Spring

### Cylinder Complete

- 200 Cylinder Bare or Complete (includes parts 203 and 116)
- 203 Steam Chest Stud and Nut
- 116 Thumb Screw

### Rotation Complete

- 130 Rifle Bar
- 129 Rotation Ratchet
- 133 Rotation Washer
- 127 Rotation Pawl
- 146 Rotation Pawl Plunger
- 128 Rotation Pawl Plunger Spring

### Feed Crank Complete

- 137 Feed Crank
- 138 Feed Crank Bolt and Nut

### Feed Screw Complete

- 135 Feed Nut
- 136 Feed Nut Nut
- 236 Feed Nut Nut Lock Washer
- 162 Feed Screw

### Piston Complete ("32" type)

- 132 Brass Nut
- 201 Piston Bare (includes 140A)
- 140A Piston Bushing
- 141A U-Bolt
- 143 Piston Ring
- 144 Piston Ring Spring
- 149A U-Bolt Nut
- 209 Chuck Key

### Piston Complete ("42" type)

- 132 Brass Nut
- 201A Piston Bare
- 140B Piston Half Bushing
- 141B U-Bolt
- 143 Piston Ring
- 144 Piston Ring Spring
- 174 Chuck Key Wedge
- 149B U-Bolt Nut
- 209B Chuck Key

### Piston Complete ("44" type)

- 132 Brass Nut
- 201A Piston Bare
- 140B Piston Half Bushing
- 141C U-Bolt
- 143 Piston Ring
- 144 Piston Ring Spring
- 149B U-Bolt Nut
- 209C Chuck Key

### Shell Complete ("24" type)

- 163 Shell, Bare (includes parts 157)
- 157 Standard and Nut
- 257 Standard Lock Washer
- 164 Shell Cap
- 165 Shell Cap Bolt and Nut
- 265 Shell Cap Bolt Lock Washer
- 158 Crosshead

### Shell Complete ("44" type)

- 163A Shell, Bare (includes parts 157A)
- 157A Standard and Nut
- 257A Standard Lock Washer
- 164A Shell Caps
- 165A Shell Cap Bolt and Nut
- 265A Shell Cap Lock Washer
- \*158A Crosshead
- 282 Shell Cap Liner
- 266A Drill Feed Stop

### Steam Front Head ("15" type)

- 112A Front Head, bare (2 pieces) (includes part 102A)
- 102A Front Head Bolt and Nut
- 111A Split Gland
- 151A Split Gland Bolt and Nut
- 117A Through Bolt and Nut

### Air Front Head ("15" type)

- \*159A Air Front Head, 2 pieces (includes parts 102A and 160)
- \*102A Air Front Head Bolt and Nut
- 160 Cup Leather
- \*117B Through Bolt and Nut

### Air Front Head ("58" type)

- 166 Air Front Head, 2 pieces
- 168 Front Head Bushing, 2 pieces
- 160 Cup Leather
- 167 Front Head Sleeve
- 117C Through Bolt and Nut

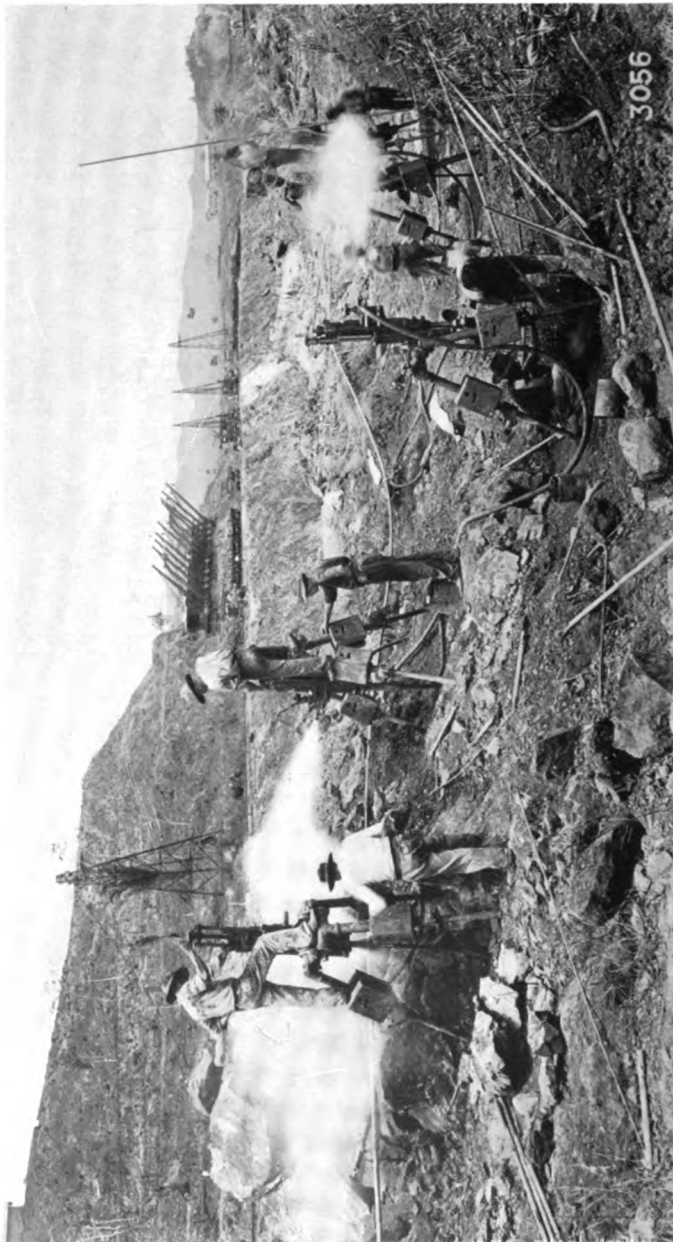
### Miscellaneous Parts

- 123 Back Head
- 152 Cushion Spring
- 169 Cushion Spring Strap
- 154 Feed Crank Washer

Parts marked (\*) not shown in illustration.

When ordering duplicate parts, always give the SYMBOL of the DRILL (which is cast on the side of the cylinder) and the NUMBER of the DRILL (which is stamped on the front of the cylinder, near the top), also NUMBER and NAME of part as per above list.

**"ARC VALVE" TAPPET ROCK DRILLS**



Ingersoll-Rand Drills on the Panama Canal at Empire, C. Z. 339 Ingersoll-Rand Drills are used on the Canal